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The Effect of NPK-Zeo Fertilizer on Growth and Production of Cucumber (*Cucumis sativus* L.) in Iwoimopuro Village, Kolaka District

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Abstract

The Effect of NPK-Zeo Fertilizer on Growth and Production of Cucumber (Cucumis sativus L.) in Iwoimopuro Village, Kolaka District. This research aimed to determine the effect of liquid fertilizer NPK-ZEO growth and result of cucumbers. This research has taken place in the village Iwoimopuro, District Wolo, Kolaka District. This research is compiled using a Randomized Block Design (RBD). Obser rations were made on plant height, leaf number, age of the plant begins to flower, age of the plant begins to bear fruit, fruit number and fruit weight. The data were processed using the Finger Print Car List (Anova) followed by Least Significant Difference Test (LSD). The results showed that administration of NPK-ZEO significant effect on plant height, leaf number, age of the plant begins to flower, age of the plant begins to bear fruit, fruit number and fruit weight

Keywords: NPK-ZEO, (*Cucumis sativus* L.)

A. Introduction

Cucumber plants (*Cucumis sativus* L.) is one of the most consumed fruit vegetables in Indonesia, the freshness of cucumbers makes these vegetables have a lot of marinade. This is comparable to the market demand that is always high in vegetables, therefore many people are starting to be interested in cultivating these vegetables (Nawangsih, 2001).

NPK fertilizer is a type of compound fertilizer which contains three main nutrients at once. This fertilizer is a macro element that is absolutely needed by plants. As the name implies, these elements consist of elements N (nitrogen), P (phosphorus) and K (potassium). The NPK element is the main macro nutrient that is important to help plants carry out a series of plant processes (Rosmarkam & Yuwono, 2002).

Based on the Agricultural, Fisheries and Forestry Counseling Center in Wolo District (2010), land in Iwoimopuro Village, Wolo District is flat land and classified into alluvial and humus soils. Alluvial soils are also called sedimentary soils. River mud that settles in the lowlands will form sedimentary soils. Generally, this soil has a good fertility rate, so it can be used for farming. Whereas humus soil is soil formed from decay of plants. This soil type is dark and loose in nature so it is very suitable for agriculture (Munir, 1999).

The NPK element is very necessary for cucumber plants both to support growth and yield. NPK fertilizer is a compound fertilizer that has been mixed in such a way by the factory that it can be directly used. NPK is three nutrients that absolutely must exist and are needed in large quantities, so that the fertilizer produced has been prioritized containing nitrogen, phosphorus and potassium (N, P, K) (Lingga & Marsono, 2007).

NPK-ZEO compound liquid fertilizer is a compound liquid fertilizer that is enhanced by its elements which are easily absorbed by all parts of the plant from leaves, stems, fruits, to the roots and are very safe for soil structure. Based on the analysis of the Jogjakarta Institute of Agricultural Technology, NPK-ZEO compound liquid fertilizer contained elements of pH H2O 4.05%, N 5.2%, P2O5 2.37%, K2O 14.02%, Zn 1.21%, Boron 1.16%, Cu 0.52%, Mn 1.09%, Mo 0.16%, Co 0.15%, As 0.62%, Cd 0.01%, Pb 1.12%, and Hg 6.56%.

B. Methodology

This research was compiled based on Randomized Block Design (RBD) with the use of liquid NPK compound fertilizer as the single factor to be studied. The use of NPK compound fertilizer will consist of 4 levels, namely: NPK0 (control or not given NPK), NPK1 (concentration of 20 cc / l water), NPK2 (concentration of 40 cc / l water) and NPK3 (concentration of 60 cc / l water). Each treatment was repeated 3 times so that there were 12 experimental units in total.

Implementation of Research

Planting Preparation

1. Hatchery

The seeds are sown on plastic containing soil. Each polybag is filled with cucumber seeds as deep as 0.5-1.0 cm. After planting, it is covered with soil.

2. Land Preparation

The experimental land is cleaned of weeds by eroding and hoeing the soil. After weeds are cleaned, hoeed the experiment area as deep as ± 20 cm. Then the soil is left for 1 week then the soil is smoothed and flattened.

3. Formation of beds

The formation of beds is adjusted to the height of water on the land. The maximum length of beds is 3 m, height of beds is 40-60 cm, width of beds is 250 cm, distance of beds is 25 cm, and distance between rows of beds is 50 cm.

4. Planting and Maintenance

Seeds that are 10-14 days old, fresh green leaves can be transferred to the planting area.

Maintenance

Embedding is carried out as soon as the plants show signs of stunted (dead) growth or loss of seedlings due to being eaten by pests by replacing them with embroidered plants, embedding is done 1 week after planting. Weeding is done manually or by using hoes in accordance with the conditions of weeds that grow. Giving water (irrigation) is carried out routinely twice a day (morning and evening), especially in the initial phase of growth and the weather conditions are dry. Installation is done as early as possible (± 5 days after planting) so as not to disturb or damage the roots of cucumber plants. Cucumber plants that are ± 21 days old usually grow thickly leafy, need to be trimmed several leaves to stimulate the formation of flowers and fruit while accelerating fertilization. Pest and disease control will be carried out physically mechanically (picking up pests and turning them off and uprooting the disease-affected plants), unless forced to use pesticides as intended for use.

NPK-ZEO compound liquid fertilizer is given to plants when the cucumber plants are 2 weeks after planting and carried out until the plants emit flowers. Spraying is done by spraying all parts of the cucumber plant in accordance with the recommended concentration.

Harvesting

Cucumber fruit can be harvested when the plants are 2-3 months after planting.

1. *Observation*

Some growth variables and results that will be observed in this study are:

a) Plant height (m), measured at flowering.
b) Number of leaves (strands) at the time of flowering.
c) Plant life begins to flower (HST).
d) Plant age begins to bear fruit (HST).
e) The average number of fruit / stem of cucumber (fruit).
f) Average fruit weight of cucumbers (kg).

In each of the above observations, three sample plants were randomly drawn in each population (plot) to be measured / calculated according to the purpose of observation, *then averaged.*

2. *Data Processing Techniques*

Data will be processed tabulation on each observation variable, according to the number of treatment combinations in the number of replications used. Tabulations include the results of observations on each variable, the list of variance (ANOVA) and the average value of treatment along with the LSD comparison value (NP).

Data from the observation of each observation variable were analyzed based on variance and F test. If F count> F table means that the treatment tried significantly ($\alpha = {}_{0.05}$) or very significant effect ($\alpha = 0.01$) so that it can followed by LSD test (${}_{0.05}$) to see the difference between each treatment level tested.

C. Result and Discussion

Observations on plant height were measured at flowering, number of leaves at flowering, age of plants began to flower, age of plants began to bear fruit, average number of fruit / stem of cucumber, and average fruit weight of cucumbers showed significant effects in various observations as follows :

1. Result

Plant Height Measured When Flowering

Table 1. The Smallest Significant Difference Test (LSD $_{0.05}$) The Average Height of the Cucumber Plant at Flowering (cm)

Treatment	Average Plant Height (cm)	comparative value of $SD_{0,05}$
NPKO	128,52[a]	5.42
NPK1	131,80[a]	
NPK2	139,14[b]	
NPK3	141,26[b]	

Description: The average number followed by the same letter, is not significantly different from the LSD Test $_{0.05}$

The LSD0.05 test results in table 1 show that the NPK3 treatment (60 cc / liter of water) provides the highest plant height (141.26 cm), and NPK3 treatment is not significantly different from the NPK2 treatment (40 cc / liter of water) will but it was significantly different from the treatment of NPK1 (20 cc / liter of water) and NPK0 (without treatment). In contrast, NPK0 treatment produced the lowest plant height (128.52 cm) and NPK0 treatment was not significantly different from NPK1 treatment, but it was significantly different from NPK2 and NPK3 treatments.

Number of Leaves When Flowering

Table 2. The Smallest Significant Difference Test (LSD $_{0.05}$) Average Number of Leaves of Cucumber Plants at Flowering (Strands)

Treatment	Average Number of Leaves (strands)	comparative value of $LSD_{0,05}$
NPKO	22,33[a]	2,30
NPK1	25,00[b]	
NPK2	24,67[b]	
NPK3	27,22[b]	

Description: The average number followed by the same letter, is not significantly different from the LSD Test $_{0.05}$

The $LSD_{0.05}$ test results in table 2 show that the NPK3 treatment (60 cc / liter of water) shows the highest number of leaves (27.22 strands), and NPK3 treatment was not significantly different from NPK2 treatment (40 cc / liter of water) and treatment NPK1 (20 cc / liter of water) but significantly different from NPK0 treatment (without treatment). In contrast, NPK0 treatment produced the least number of leaves (22.33 strands) and NPK0 treatment was significantly different from the treatment of NPK1, NPK2 and NPK3.

Plant age begins to flower

Table 3. The Smallest Significant Difference Test (LSD $_{0.05}$) Age Average Cucumber Plants Start Flowering

Treatment	Average Age of Plants Starts Flowering	comparative value of $LSD_{0,05}$
NPKO	29,33[a]	0,76
NPK1	28,22[b]	
NPK2	26,56[c]	
NPK3	25,78[d]	

Description: The average number followed by the same letter, is not significantly different from the LSD $_{0.05}$ test

The LSD $_{0.05}$ test results in table 3 show that the treatment of NPK3 (60 cc / liter of water) produces the fastest growing age of the plant (25.78 days), and the NPK3 treatment is significantly different from the NPK2 treatment (40 cc / liter of water) , treatment of NPK1 (20 cc / liter of water) and NPK0 treatment (without treatment). In contrast, the NPK0 treatment yielded the lowest age for plants to start flowering (29.33 HST) and NPK0 treatment was significantly different from the treatment of NPK1, NPK2 and NPK3.

Plant age begins to bear fruit

Table 4. The Smallest Significant Difference Test (LSD $_{0.05}$) Age Average of Cucumber Plants Start to Be Fruitful

Treatment	Average Age of Plants Starts Fruiting	comparative value of $LSD_{0,05}$
NPKO	44,22[a]	0,87
NPK1	42,89[b]	
NPK2	42,00[c]	
NPK3	40,67[d]	

Description: The average number followed by the same letter, is not significantly different from the LSD $_{0.05}$ test

The results of the LSD $_{0.05}$ test in table 4 show that the treatment of NPK3 (60 cc / liter of water) resulted in the fastest age of fruiting plants (40.67 days), and NPK3 treatment was significantly different from the NPK2 treatment (40 cc / liter of water), treatment of NPK1 (20 cc / liter of water) and NPK0 treatment (without treatment). In contrast, the NPK0 treatment resulted in the lowest plant age (44.22 HST) and NPK0 treatment significantly different from the NPK1, NPK2 and NPK3 treatments.

Average Fruit / Cucumber Stem

Table 5. The Smallest Significant Difference Test (LSD $_{0.05}$) Average Fruit Number / Cucumber Stem (fruit)

Treatment	Average Number of Fruits / Stems of Cucumber (fruit)	comparative value of $LSD_{0,05}$
NPKO	14,00[a]	3,14
NPK1	14,22[a]	
NPK2	16,56[b]	
NPK3	19,00[b]	

Description: The average number followed by the same letter, is not significantly different from the LSD $_{0.05}$ test

The LSD 0.05 test results in table 5, show that the treatment of NPK3 (60 cc / liter of water) gives the highest number of cucumber fruit / stem (19,00 pieces), and this treatment is not significantly different from NPK2 treatment (40 cc / liters of water), but significantly different from the treatment of NPK1 (20 cc / liter of water) and NPK0 (without treatment). On the contrary, NPK0 treatment produced the lowest number of fruits (14.00 pieces) and NPK0 treatment was not significantly different from NPK1 treatment, but it was significantly different from NPK2 and NPK3 treatments.

Average Fruit Weight of Cucumbers

The LSD $_{0.05}$ test results in table 6, showed that the treatment of NPK3 (60 cc / liter of water) gave the heaviest average fruit weight of cucumbers (0.773 kg) and NPK3 treatment was significantly different from the NPK2 treatment (40 cc / liter of water),

treatment NPK1 (20 cc / liter of water) and NPK0 (without treatment). Conversely, NPK0 treatment produced the lowest fruit weight (0.610 kg), and NPK0 treatment was not significantly different from NPK1 treatment, but it was significantly different from NPK2, and NPK3 treatment.

Table 6. The Smallest Significant Difference Test (LSD0.05) Average Fruit Weight of the Cucumber

Treatment	Average Cucumber Fruit Weight	comparative value of $LSD_{0,05}$
NPKO	0,610[a]	0,07
NPK1	0,618[a]	
NPK2	0,676[b]	
NPK3	0,773[c]	

Description: The average number followed by the same letter, is not significantly different from the LSD Test 0.05

2. Discussion

The N element contained in NPK-ZEO compound liquid fertilizer is thought to be able to increase vegetative growth of plants such as root systems, stems, leaves, especially chlorophyll components in leaves. This is in accordance with the opinion of Buckman and Brady (1999), which states that elements in plants can increase vegetative parts, give green color to leaves, increase the percentage of protein content in fruit formation, and function as a regulator in the use of phosphorus, potassium and elements other elements.

The P element found in NPK-ZEO compound liquid fertilizer is thought to be able to increase the process of protein formation, fruit size and weight, and play a role in the process of photosynthesis and also as an energy source. Ispandi (2005), that element P is an element as a form of ATP which is an energy source for all metabolic processes in cells including the formation and process of transportation that takes place in plant tissues further Gardner, F., Pearce, R.B. & Mitchell, R.L. (2000), explain that crop yields are determined by the processes that control production include supply of nutrients, minerals and photosynthesis. Increased metabolic activity means that it can increase the process of forming proteins that are formed, then transferred to seeds as food reserves, so that the greater the food reserves formed in the fruit, the greater the number and size of fruit produced by plants.

The K element found in NPK-ZEO compound liquid fertilizer is thought to be able to improve metabolic functions, root systems, protein formation, activate enzymes, facilitate absorption of essential nutrients, and increase resistance to disease attack and stimulate the filling of seeds. Hardjowigeno (2002), asserts that the K element in plants functions to activate enzymes, improve the development of root systems, enhance resistance to pest and affect the absorption of other essential elements.

D. Conclusion

Based on the results of the study, it can be concluded as follows:

1. The administration of NPK-ZEO with concentration (60 cc / liter of water) NPK3 gives the best results on each observation variable, namely plant height, leaf number, flowering age, fruiting age, number of fruit / stem and fruit weight.
2. NPK0 treatment (without treatment) gives the lowest results on each observation variable

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